OFFICE OF RESPONSE AND RESTORATION . NOAA'S NATIONAL OCEAN SERVICE

# Plastic Marine Debris What We Know



#### **Frequently Asked Questions**

http://marinedebris.noaa.gov/info/plastic.html

## Is plastic a large portion of the debris that enters our oceans? How much?

Because marine debris of all types enter our oceans, plastics of every type can be found, from the PET used to make many plastic bottles, to the polystyrene or "Styrofoam" cups and the nylon line used in fishing nets. Plastic likely makes up a sizeable portion of the marine debris that exists today. Exactly how much plastic debris is out there, or even what percentage plastic debris makes up, is very difficult to know and can vary by location. There is simply so much that we do not see.



Plastic bottle, such as those shown above, are some of the more common types of debris found on beaches in Hawaii.



Derelict fishing gear, such as the net shown above, are entanglement hazards for marine life.

## Are all plastics created equal once they are in the environment? Do some cause more damage than others?

In terms of what we know, derelict fishing gear (DFG) (much of which is made of plastic) has numerous and quite severe impacts not only to living marine resources, but navigation safety as well. Numerous studies have documented the impacts of DFG to wildlife, including entanglement, ghostfishing (continuation of derelict fishing gear to capture marine life), habitat degradation, and even alien species transport. All of these likely having a related economic cost.

### Is there a source/reference to see an actual plot of plastic marine debris occurrence?

Currently, there is no comprehensive map plotting plastic debris occurrence. Because marine debris moves with winds and currents,

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sometimes far from its origin, it has become a global problem. If there were a map of plastic debris occurrence, it would most likely include coastal areas worldwide – monitoring and debris accumulation studies and survey results could be used. Of course, the map would only show marine debris that can be seen or that is washing ashore. Studies are now also being done on marine debris that is more difficult to see: benthic (seafloor) marine debris (e.g., Monterey Bay, CA and the Gulf of Mexico), and microplastics and small plastic particles.

An accurate and quantitative marine debris map would be very useful, and through collaborative efforts like the Hawaii Marine Debris Action Plan (*http://marinedebris.noaa.gov/projects/himdap. html*) working group, this can be done on a state or local level as a beginning to fully understanding the occurrences of marine debris.

#### Do plastics degrade in the environment?

Plastic photo-degrades--breaking down into smaller and smaller pieces due to exposure to solar UV radiation. However, when in water plastic does not get direct sunlight exposure, therefore breakdown happens much more slowly in the aquatic environment. So far as we know, based on research to date, plastics do not ever fully "go away," (breakdown into their inorganic components of CO2 and H2O) but rather break down into smaller and smaller pieces, sometimes referred to as microplastics. Petroleumbased plastics are not biodegradable.



One source of microplastics is through the fragmentation of larger pieces.

### Have there been studies by NOAA on impacts of plastics to marine mammals and fish?

The NOAA Marine Debris Program and other NOAA offices have supported numerous studies on the impacts of plastics to marine mammals, fish, and their habitats. Many of these studies have dealt with plastic derelict fishing gear (e.g., nylon fishing nets), a debris type that can pose a significant threat to a wide range of marine species and habitats.



A close-up of microplastic marine debris.

## Is it true that our fish are being poisoned by marine debris? (plastics and pollutants)

There have been a number of studies on persistent organic pollutants (POPs) binding to plastic debris in the oceans. One of the leading scientists on the topic is Dr. Richard Thompson (Marine ecologist, University of Plymouth, UK), who along with other experts in this topic area, was invited to an international workshop on the occurrence, effects, and fate of microplastic debris in September of 2008 hosted by the MDP and the University of Washington-Tacoma. You can find additional information, including a proceedings

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document of this workshop at http://marinedebris.noaa.gov/projects/rschwkshop.html.

Recent studies have focused on the uptake potential of organic contaminants from the marine environment to plastic debris.

Plastic debris can transport organic contaminants in the oceans.

Plastics have the potential to adsorb organic contaminants from the marine environment. It is possible, though not proven, that plastics could also desorb these contaminants to biota that ingest plastics.

Plastic debris attracts and accumulates hydrophobic organic toxins such as PCBs (polychlorinated biphenyls) up to 105-106 times ambient seawater concentrations (Mato et al., 2001).

Research on benthic-feeding invertebrates suggests that toxins may be transferred from plastics, to sediment, to the organism. Further research is needed, taking into consideration the range of contaminant types, types of plastic, and environmental exposure effects (Teuten et al., 2007).



A derelict fishing net, likely made of nylon, a type of plastic, covers a coral reef. *Photo courtesy of NOAA PIFSC CRED.* 

#### **Literature Cited**

Teuten, E., S. Rowland, R. Galloway, and R. Thompson. 2007. Potential for Plastics to Transport Hydrophobic Contaminants. Environ. Sci. and Tech. 35: 318-324.

Mato, Y., T. Isobe, H. Takada, H. Kanehiro, C. Ohtake, and T. Kaminuma. 2001. Plastic Resin Pellets as a Transport Medium for Toxic Chemicals in the Marine Environment. Environ. Sci. Technol. 35: 318-324.

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